

REMARKS

Claims 1-59 are pending.

Claims 1-8, 10-21, 34-38, and 40-51 are under consideration.

Claims 9, 22-33, 39, and 52-59 have been withdrawn from consideration.

Claims 1, 4, 8, 10, 12, 14, 20, and 48-49 are currently amended.

Support for the amendments to claim 1 and 4 is found in original claim 5. Support for the amendment to claims 10, 12, and 14 is found in original claim 19. All other amendments pertain to matters of form and are supported by the specification and claims as originally filed.

Claims 5, 19, 34, and 46-47 are cancelled without prejudice.

It is believed that no new matter will be added upon entry of the amendment.

The objections to the Abstract and Claims 1, 8, 10, 12, and 14 are obviated by amendment. It is requested that the Examiner withdraw these objections.

The rejection of claims 20 and 48-49 under 37 U.S.C. § 112, second paragraph, is obviated by amendment. Applicants have amended these claims setting forth the proper Markush group language. It is respectfully requested that the Examiner withdraw this rejection.

The rejection of claims 1-8 and 34-38 under 35 U.S.C. § 102(b), or alternatively under 35 U.S.C. § 103(a), in view of Parrott (U.S. 4,720,472) is traversed.

The method of production for the catalyst in Parrott differs from that which is claimed in two ways. First, Parrott describes impregnating alumina with both titanium and silicon by absorption from a solution that contains both titanium and silicon alkoxides. Second, the titanium-silicon-impregnated alumina particles are then calcined at a temperature ranging to 800 – 1500°F (427 – 816° C; col 2, ll. 41-44). After the calcining step, this material "is then

promoted utilizing nickel and molybdenum oxide," which is subsequently "calcined at a temperature ranging from about 500° to about 1500°F (260 – 816°C; col. 2, ll. 46-52).

This is in contrast to one aspect of the claimed invention, in which (Claim 1):

A hydrogenation catalyst for hydrocarbon oil, which is produced by **impregnating** a refractory inorganic oxide carrier with a solution containing a water-soluble metal compound of Group 4 of the Periodic Table so that it carries the metal compound, then **further impregnating** with an aqueous solution containing at least one metal compound of Group 6 and at least one metal compound of Groups 8 to 10 of the Periodic Table so that it carries the metal compounds, and **thereafter heating** it at a temperature **not higher than 300 °C**; wherein said refractory inorganic oxide carrier is alumina. (Emphasis added here.)

The difference in impregnating with a Group 4 metal, followed by at least one metal compound of Groups 8 to 10, with subsequent heating no greater than 300 °C (572 °F) than that which is described by Parrott can be realized by the following discussion.

The Examiner's attention is directed to the three attachments which should be consulted throughout a discussion of the following. The three attachments included: (1) A scheme representing the differences between catalysts 1 and 5; (2) comparison infrared spectra (4000 – 3000 cm⁻¹ region) of catalysts 1 and 5; and (3) a copy of Lewis and Kydd; *Journal of Catalysis* 136, 478-486 (1992). For the sake of completeness, Applicants have cited this reference in an information disclosure statement filed concurrently herewith.

Impregnating the refractory inorganic oxide with a Group 4 metal, followed by heating, results in the formation of several types of metal hydroxides that possess varying degrees of basicity (see Scheme and Lewis and Kydd article (page 480)). The most basic hydroxyls are those that are terminally coordinated to aluminum (Type I). Relying on basic principles, it is natural then to realize that a doubly-bridged hydroxyl (Type II) is less basic than a terminal hydroxide, and that a triply-bridged hydroxyl (Type III) is the least basic (most acidic) of these types of hydroxyls. Using the Lewis and Kydd article as a guide for

interpretation, one can inspect the comparison Infrared Spectra (IR) of catalysts 1 and 5 and see that there is a pronounced effect upon heating the impregnated material at a temperature that exceeds 300°C. Tentatively assigning the Type I (most basic hydroxyl) at about 3780 cm^{-1} and the Type III at about 3700 cm^{-1} , it can be seen that catalyst 1 has a greater concentration of Type III hydroxyls than does Catalyst 5. The difference between these two catalysts is that catalyst 5 was heated (after impregnating) to a temperature in excess of 300°C. (See page 47, second full paragraph, for experimental conditions for the preparation of catalyst 1; and page 50, second full paragraph, for catalyst 50.) Thus, there is a chemical difference between the two species in that the number of different types of metal bound hydroxyls between the two catalysts is different. This difference manifests itself in the desulfurization activity, which is tabulated on page 72 in Table 3. In short, catalyst 1 is 36 % more active than catalyst 5. This difference is at least partially attributable to the chemical differences between the two catalysts, as detected by IR spectroscopy.

Thus, not only is the product-by-process language warranted in this case, as the heating after impregnation result in a change in chemical composition/structure; but it should be apparent that the rejection in view of Parrot's disclosure is not warranted.

Therefore, it is requested that the Examiner withdraw this rejection.

Since Parrott's disclosure contains no suggestion or motivation to heat the impregnated material at a temperature not higher than 300°C, it is believed that there can be no case of obviousness as well. It is kindly requested that the Examiner acknowledge the same.

Additionally, the rejection of claims 1-8, 10-21, 34-38, and 40-51 under 35 U.S.C. § 102(b), or alternatively under 35 U.S.C. § 103(a), in view of Kukes et al. (US 4,870,044) is traversed.

Kukes discloses that the catalyst is calcined at a temperature in the range from about 500 to about 900°C (col. 8, ll. 12-17). As noted above, the exposure of the impregnated material to varying temperatures serves to affect the compositional/structural makeup of the material. While Kukes discloses ethylene glycol as just a solvent, the solvent would necessarily volatilize through the higher temperature calcinations of 500° – 900°C. On the other hand, the combination of using a water soluble organic compound such as polyethylene glycol and lower temperature calcination causes a high catalytic activity for desulfurization, because polyethylene glycol remains on catalyst. Since Kukes employs a temperature that is greater than that which is claimed herein (please see claim 1), it is believed that Kukes material is fundamentally different than the catalyst that is produced by the process as claimed herein (see claim 1).

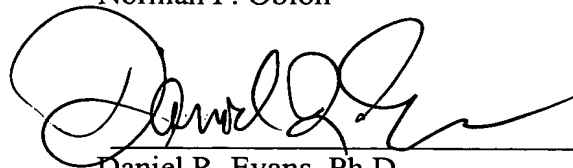
Therefore, it is requested that the Examiner withdraw this rejection.

Since Kukes disclosure does not contain a suggestion or motivation to heat the impregnated material at a temperature not higher than 300°C, it is believed that there can be no case of obviousness as well. It is kindly requested that the Examiner acknowledge the same.

In view of the amendments, comments, and supporting information, it is believed that the claims are in a condition for allowance. An early and favorable indication of the same is respectfully requested.

Respectfully submitted,

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